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NO. 3 OF 1987

REGRESSION ESTIMATES OF FERTILITY FOR INDIA 1971 AND 1981

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With regards
and Compliments
to Shri P. Padmanabh
N Rama Rao

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FOREWORD

Under the agreement on Family Planning Communications and Marketing between the Government of India and the United States of America through the Agency for International Development (USAID), the Demographic Analysis Component has been assigned to the Registrar General, India to execute. Activities under the Component include training, workshops, conferences and research activities, in collaboration with the institutions in the United States of America like the East-West Population Institute, East-West Center, Honolulu, Hawaii and the Bureau of the Census, Washington D.C.

This study is a result of the collaborative research between the East-West Population Institute and the Office of the Registrar General, India.

I thank the authors for the effort put in by them and hope that this work will be of interest to data users. I also thank the United States Agency for International Development and the East-West Population Institute for making the research work possible.

V.S. Verma
Registrar General &
Census Commissioner, India

New Delhi
April 13, 1987

ACKNOWLEDGEMENTS

This study results from collaborative work between the Office of the Registrar General, India, and the East-West Population Institute, East-West Center. The basic data used in this report were published by the Office of the Registrar General, India, and calculation of the fertility estimates was carried out in 1986 by Shri N. Rama Rao, Assistant Registrar General, while he was at the East-West Population Institute as a Fellow.

We would like to thank Shri V.S. Verma, Registrar General and Census Commissioner, India, and Dr. Lee-Jay Cho, Director, East-West Population Institute, East-West Center, for their support and encouragement. We are also grateful for the opportunity to undertake this study provided by an ongoing cooperative agreement involving the Government of India, the East-West Population Institute, East-West Center, and the United States Agency for International Development.

Final drawing of map and diagram included in the publication was made in the Map Division of the Office of the Registrar General, India under the guidance of Dr. B.K. Roy, Deputy Registrar General (Map) to whom we are thankful. Our thanks are due to Ms. Victoria T.Ho and Mr. Wayne Shima of the East-West Population Institute, for the excellent computing assistance we received.

We are also thankful to Shri B.P. Jain, Assistant Director and his colleagues in the Printing Division of the Office of the Registrar General, India for getting this publication printed quickly.

The views expressed in this report are those of the authors and not necessarily those of the organizations in which they work.

Honolulu-Hawaii (USA)
September 24, 1986

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I. INTRODUCTION

A recent comprehensive review of vital rates in India for the years 1961-1981 concluded that :

> Performing research on the demography of India can be a humbling experience. Pitfalls in Indian data are sometimes obvious and sometimes hidden, and demographic scenarios can be very different depending on how one chooses to correct them. We are impressed by the degree to which demographic analyses in India must be a continuous activity of updating and integrating estimates (Mari Bhat, Preston, and Dyson 1984, p. 13).

In the present paper, we provide a new set of estimated vital rates for India, fertility rates estimated using the 1981 Census data, as part of the necessary, continual updating process.

We offer estimates of the total fertility rate (TFR) and crude birth rate (CBR) for all of India, her major states, and urban and rural sub-divisions of those states for both 1971 and 1981. The estimates were prepared using Palmore's (1978) regression methods, a technique not previously applied to India's 1981 Census. We also compare these estimates with the results of selected other fertility estimation techniques, leading us to the conclusion that our new estimates probably provide a reasonably accurate picture of the current fertility situation in India. Finally, we review fertility trends in the 1971-1981 decade.

The need for new estimates is clear. India's population is already the second largest in the world, and if fertility remains at high levels, India may become the largest. Between 1971 and 1981, a population of some 137 million—more than half of the

population of the United States of America—was added to India's numbers. By 1981, India's population was 685 million, and the annual rates of growth of the population appeared to be accelerating up until 1971 and then levelled off.

The annual growth rates for India as a whole, shown in Table 1, were less than one percent prior to 1921, remained at 1.4 percent or lower from 1921 to 1951, but then increased to almost 2 percent in 1951-1961, 2.24 percent in 1961-1971, and 2.28 percent in 1971-1981. Among the fourteen states with more than 10 million persons in 1981, excluding Assam, eight states (Gujarat, Haryana, Kerala, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, and West Bengal) did show lower annual growth rates in 1971-1981 than in 1961-1971. Six of the largest states, however, had higher growth rates in the most recent decade (Andhra Pradesh, Bihar, Karnataka, Punjab, Rajasthan, and Uttar Pradesh).

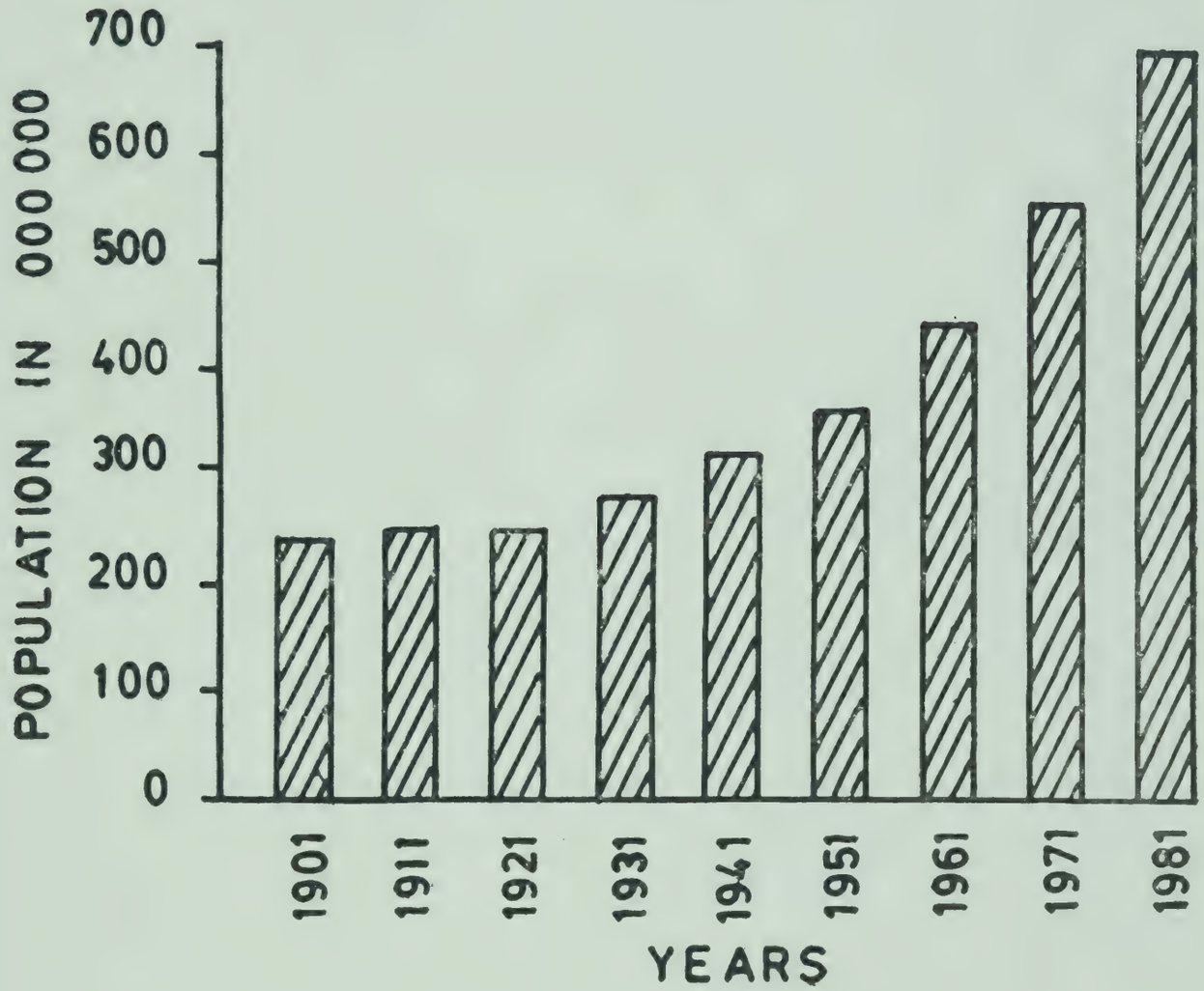
TABLE 1 : Population of India, and Annual Growth Rates, 1901-81

Year	Population (thousands)	Annual Growth Rate (per cent)
1901	238,396	
1911	252,093	0.56
1921	251,321	—0.03
1931	278,977	1.06
1941	318,661	1.34
1951	361,088	1.26
1961	439,235	1.98
1971	548,160	2.24
1981*	685,185	2.28

Source : Census of India, 1981 (1984a)

*Includes projected population of Assam State

POPULATION OF INDIA 1901-81



To be sure, the increase in growth rates has been due mainly to rapid decreases in mortality rates, with the crude death rate being halved since the beginning of this century (Ministry of Health and Family Welfare, Government of India, 1984, p. 52). Nevertheless, despite vigorous efforts by the government's family planning program, fertility rates have not declined as fast as anticipated. Official government estimates suggest that 0.6 million births were averted through program efforts in 1955-1966, increasing to some 20 million in 1966-1976 and more than 40 million during the 1976-1984 period (Ministry of Health and Family Welfare, Government of India, 1984, p. 152). Yet the crude birth rate in 1980-1981 was still as high as 34.30 (Census of India, 1981. 1984 m., p. 3).

As mortality rates continue to fall, fertility rates will obviously be the main determinant of India's future growth. The assessment of levels and trends in fertility, hence, is vital to planning, and new estimates are important in allowing better understanding of the probable true levels of these rates.

II. DATA AND METHODS

The possible sources to use in estimating fertility for India are numerous, with the principal recent sources including a 1972 national fertility survey, the 1979 Infant and Child Mortality Survey, regular data from the Sample Registration System, the decennial censuses in general and the 1981 Census five percent sample data in particular.[1] This report relies primarily on the five percent sample data from the 1981 Census, chosen because of their recency and the fact they would allow estimates based on data different from those used in the regular Sample Registration System.

We also faced choices between a number of prominent estimation methods : the Brass methods (e.g., Brass 1975 and United Nations 1983), the own-children method (Cho, Retherford, and Choe 1986), and several regression methods (Bogue and Palmore 1964, Rele 1967, Palmore 1978, Gunasekaran and Palmore 1984, and Rele 1987) were among our final list.[2] The own-children method has not been used in this report because the needed tabulations were not yet available.[3]

As can be seen in later sections of this report, we finally used Palmore's 1978 regression methods as the main estimation strategy. For comparison, however, selected estimates were also prepared using the Brass methods, the Gunasekaran and Palmore 1984 method and Rele's (1967 and 1987) methods.

Palmore's 1978 Method : A Review

Regression methods for fertility estimation are all based on similar reasoning : they use information about the age distribution as their primary data. The methods due to Bogue and Palmore (1964), Rele (1967), and Palmore (1978) all rely on the child-woman ratio (the ratio of the population at the start of the age

distribution to women in the center of the age distribution) as the primary input data. The child-woman ratio is the result of recent fertility rates, later modified by migration and mortality and, of course, affected by errors in census counts. Regression methods have come into increasing use in recent years, partly because of the simple fact that many developing country censuses tabulate the child-woman ratio by subnational geographic areas but do not routinely tabulate the information needed for other estimation techniques.[4]

The Bogue-Palmore, Rele, and Palmore methods correct the child-woman ratio by adjusting for mortality levels; and the Bogue-Palmore and Palmore methods also correct for the marital distribution of the population. Again, this information is usually part of the routine tabulation procedure for most national censuses.

The basic idea employed in Bogue and Palmore's original formulation (1964) and Palmore's 1978 revision of the regression equations for estimating fertility rates is the same. The demographic data for the nations of the world were carefully reviewed, and a selection was made of those nations for which all the following facts were reliably reported : (a) births by age of mother (b) population by age and sex (c) marital status by age and sex, and (d) deaths of infants during their first year of life. From these data it was possible to compute fertility measures and prepare regression-equations relating census-based measures with measures that combine census and vital registration data. The correlations between census-based measures and measures requiring vital statistics suggested that the basic measures are good estimates of one another.

The procedures used by Palmore in updating Bogue and Palmore's original formulation are summarized below :

(1) Data were collected for every country in the world on the items shown in the illustrative computer output in Appendix B. The most recent census year was used wherever possible.

(2) Based on a careful evaluation of the data available for each country and whether or not the vital statistics were complete or nearly so, each country was classified into one of six classes :

(a) Class 1=estimator (good data for census and vital registration and all items available)=56 countries

(b) Class 2= not to be estimated (good data for census and vital registration but some items not available) =18 countries

(c) Class 3=to be estimated (all items available but incomplete vital registration)=65 countries

(d) Class 4=to be estimated (incomplete vital registration, has all items except infant mortality rate)=1 country

(e) Class 5=to be estimated (incomplete vital registration, has all items except marital status data)=47 countries

(f) Class 6=to be estimated (incomplete vital registration, has all items except marital status data and infant mortality rate)=5 countries

(3) 56 countries were finally selected as estimators. To verify the appropriateness of the approach to be used in generalizing the regression equations, checks were made to assess whether or not the census data and the fertility rates bore linear relationships to each other. Each census variable was plotted against each fertility rate and the resulting scatter plots were visually inspected for signs of curvilinearity. It was discovered that relationships involving the age-specific fertility rates for ages 15—19 and 45—49 required non-linear equations to achieve the best fit. Otherwise linear equations appeared to be appropriate.

(4) Data for the 56 class 1 countries were used to derive regression equations relating census data and the infant mortality

rate to conventional fertility measures such as the total fertility rate. Different equations were derived for each of the last four classes mentioned in (2) above. To derive the "best" equations, it was decided that maximizing R^2 would be the criteria for selecting the best equations. It was also decided to make use of the RLEAP algorithm to select the maximum R^2 equation from all possible equations.[5]

(5) The dependent variables for the regression equation were as follows : TFR, CBR, ASFR in age groups 15—19, 20—24, 25—29, 30—34, 35—39, 40—44, and 45—49. The ordering of the dependent variables was as mentioned.

(6) For each dependent variable, many different regression equations were generated. In addition to generating different equations for each class of countries, several types of estimating equations were prepared.

(7) The newly derived regression equations can be used by first deciding the class of the country based on what data are available and subsequently choosing the equation with the highest R^2 for any dependent variable. Alternate specifications are also possible and the reader is referred to Palmore (1978) for more detail.[6]

Data Used

To apply Palmore's equations, we used data on age and marital status from the five percent sample of the 1981 Census for India and 14 major states.[7] For 1971, data were taken from the 10 percent rural sample and the 20 percent urban sample of the 1971 Census. Infant mortality rates (IMR) for India and all states except Bihar and West Bengal were taken from the 1971 and 1981 SRS estimates.

The quality of the Indian census data is vital for correct estimation. Overall, the net undercounts for recent India censuses have been reasonably small. The Post-Enumeration Check of the 1951 Census showed a net undercount of only 1.1

percent (Census of India, 1951. 1953), and the same check in 1961 and 1971 revealed undercounts in the order of 1 to 2 percent as well (Census of India, 1961. 1964 and Census of India, 1971. 1975). The 1981 Post-Enumeration Check also estimated a low net omission rate—1.8 percent (Census of India 1981. 1983a). For males, the net undercount was 1.7 percent while for females the net undercount was 1.9 percent.

Age mis-reporting is, however, a more serious problem with India's census data. Under-reporting of children in the 0—4 age group is of particular concern, and is one of the reasons Gunasekaran and Palmore developed their 1984 method (results presented later).

Equations Used

For estimating the TFR for India and all states except Bihar and West Bengal, the following equation under "Class 3 countries, Type 1 equations" derived by Palmore was chosen :

$$TFR = 13.5277\ IMR + 11.1042\ CW_2 - 176.4889\ CP_2 - 6.4698\ PEM_2 + 12.0405$$

where CW_2 is the ratio of children aged 0—4 per 1000 women aged 15—49 ; CP_2 is the percentage of the population aged 0—4 and PEM_2 is the percentage ever-married of women aged 20—24. It is apparent from this equation that the estimate of the IMR has a strong influence on the estimate of the TFR.

For the states of Bihar and West Bengal, firm estimates of the IMRs are not available. Hence, the following equation under "Class 4 countries, Type 1 equations" derived by Palmore was used :

$$TFR = 11.8550\ CW_2 - 209.8747\ CP_2 + 38.9259\ PEM_1 - 17.1339\ PEM_2 + 644.8134$$

where PEM_1 stands for the percentage ever married of women aged 15—19.

For estimating the CBR for India and twelve states (except Bihar and West Bengal), the following equation under "Class 3 countries Type 1 equations" was applied :

$$CBR = 0.0840\ IMR + 15.0978\ IFAC + 0.0121\ CW_2 + 1.6062\ CP_2 - 17.9982$$

where only the abbreviation IFAC requires new explanation.

IFAC stands for the "index of fertility age composition." It is a ratio formed by dividing (a) the number of births India's/ state's female age distribution (converted to a standard million) would yield if it had the age-specific fertility rates for the world, by (b) the number of births the world's female age distribution (converted to a standard million) yields when the world's age-specific fertility rates are applied.

Both the world's female age distribution and the age-specific fertility rates are, of course, estimates subject to debate. In the 1978 equations, Palmore actually used the average fertility rates for the 56 countries with good data and their combined age distributions. The estimated age-specific fertility rates for the world are as follows for the five year groups in 15—49: 44.29, 162.39, 160.46, 95.19, 48.81, 16.49, and 1.96. The estimated "standard million" for the world's females 15—49 is as follows : 176,222; 160,344; 134,575; 141,275; 130,354; 135,563; and 121,667.

The following equation under "Class 4 countries, type 1 equations" derived by Palmore was used for Bihar and West Bengal states :

$$CBR = 11.0712\ IFAC + 2.2520 CP_2 + 0.1928\ PEM_1 - 0.0812\ PEM_3 - 7.7773,$$

where PEM_3 stands for percentage ever married of women aged 25—29.

We defer a presentation of the resulting estimates, and a discussion of fertility levels and trends, first describing the other fertility estimates we prepared to compare with the Palmore 1978 equation estimates.

Gunasekaran and Palmore's 1984 Model

The 1978 Palmore equations we used involve the child-woman ratio and the ratio of children aged 0—4 to the total population As already mentioned, the age group 0—4 probably suffers from heavy under-counting in India's censuses. Further, the IMR and information on marital status are not always precise, and both are important inputs for the Palmore equations. To circumvent these difficulties, Gunasekaran and Palmore (1984) developed a new method for estimating the gross reproduction rate (GRR) using only the age distribution of the female population and the life expectancy at birth for females. The Gunasekaran-Palmore model is :

$$\log GRR = 9.65566 - 0.37613045 \log e_o^f + 6.08957 \log CVAG$$

$$-0.56680627 \log K_3 - 0.74030 \log \beta_2$$

where e_o^f = expectation of life at birth for females;

CVAG = σ/μ_1 is the coefficient of variation of the female age distribution, σ being standard deviation and μ_1, the mean of the female age distribution ;

$K_3 = \mu_3$ is the third cumulant (or moment) about the mean; and

$\beta_2 = \frac{K_4}{\sigma^4} + 3$ is a measure of peakedness of the distribution,

where $K_4 = \mu_4 - 3\sigma^4$ is the fourth cumulant.

The Gunasekaran-Palmore Model was applied to the 1981 census five year age distribution instead of the single year age distribution as suggested in their article. This was done because of distortions in the single year age data. caused partly because we used only the five percent sample. The expectation of life at birth

in 1980 for India and all states except Bihar and West Bengal was taken from the e_o^f values of the SRS for 1976-80. For Bihar and West Bengal, approximate values of e_o^f were used.

The Brass P/F Ratio Method

The five percent sample data from the 1981 Census were also analyzed using the Brass P/F ratio technique (Brass 1975 and United Nations 1983). This method compares the current and cumulative fertility experience of women by age and provides adjustment factors for corrected estimates of current fertility.

III. NEW FERTILITY ESTIMATES FOR INDIA AND HER MAJOR STATES : 1981

The results of applying four different estimation techniques are presented in Tables 2—9. The estimates of the total fertility rate (TFR) for India and fourteen states (for total, urban, and rural) in 1981 using the Palmore 1978 equations are given in Table 2, which also summarizes the basic input data that was used. The gross reproduction rates (GRR) estimated using the Gunasekaran-Palmore 1984 model are presented in Table 3, which also shows the total fertility rates that would result by multiplying the GRRs by 2.05, allowing comparision with the 1978 Palmore method estimates. Happily, the two sets of estimate are in close agreement : there are significant differences only for Andhra Pradesh, Gujarat, Karnataka, Kerala, and Punjab, with no difference exceeding ten percent and a correlation coefficient of 0.97.

The results obtained using the P/F ratio method are given in Tables 4—6 for all of India (Table 4), rural India (Table 5), and urban India (Table 6). In all of these tables, the second column reports age-specific fertility rates calculated from the responses of currently married women to the question on whether a child was born during the last one year. The current total fertility rate is, as can be seen in the sixth column, considerably lower than the average number of children ever born reported by the women—this being most pronounced in the urban areas. This may be due either to declining fertility or under-reported current fertility or both.

The third and sixth columns in each of these tables are not directly comparable. The third column shows cumulated fertility up to ages 19.5, 24.5, etc., whereas the sixth column relates to the mid-points of the age groups shown in the first column, that is, up to 17.5, 22.5, etc, An

Table 2. Estimates of Total Fertility Rates for India and Major States for 1981 Using Palmore's 1978 Regression Equations

India/ States	Total Rural Urban	IMR (per 1000 live births)	Ratio of Children aged 0—4 to women aged 15—49 (per 1000) CW_2	Percentage of children aged 0—4 to total population CP_2	Percentage of women aged 20—24 ever married PEM_2	Estimated TFR
India*	T	110	546	12.59	85.95	4.79
	R	119	567	12.91	90.06	5.06
	U	62	484	11.55	74.48	3.71
States						
Andhra Pradesh	T	86	514	12.16	92.61	4.14
	R	93	526	12.29	95.72	4.32
	U	52	476	11.75	84.11	3.38
Bihar	T	N.A.	597	13.37	94.62	5.82
	R	N.A.	602	13.54	96.01	5.96
	U	N.A.	560	12.25	84.77	4.87
Gujarat	T	116	518	12.42	84.10	4.60
	R	123	540	12.72	88.25	4.86
	U	89	472	11.75	75.98	3.89
Haryana	T	101	620	13.34	89.24	5.33
	R	108	643	13.56	94.06	5.61
	U	52	543	12.55	74.97	4.05

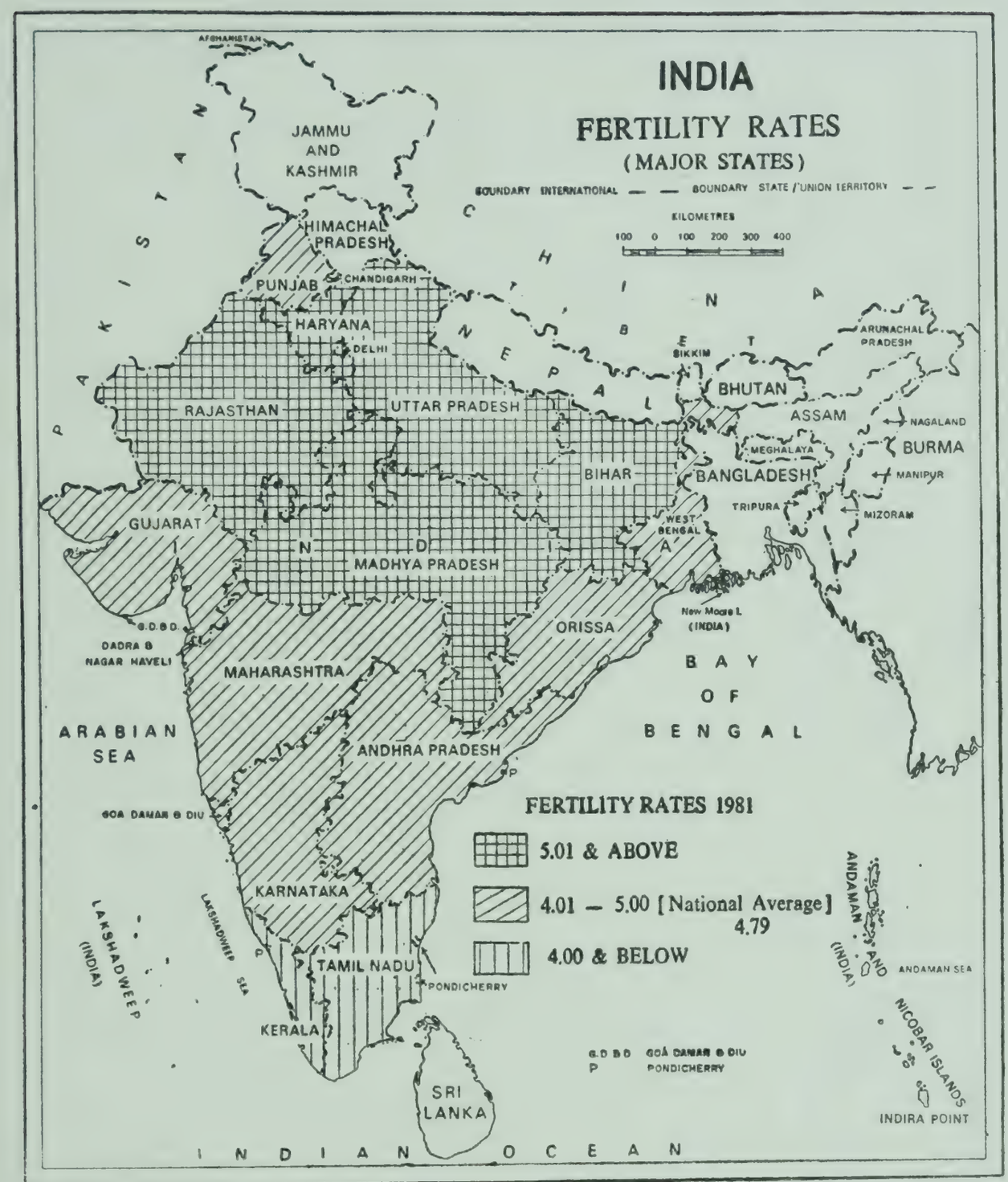
Karnataka	T	69	538	12.50	80.31	4.19
	R	77	557	12.73	84.74	4.44
	U	45	496	11.93	71.12	3.56
Kerala	T	37	409	10.77	59.66	2.77
	R	40	419	10.97	60.92	2.88
	U	24	367	9.91	54.38	2.31
Madhya Pradesh	T	142	611	13.59	93.54	5.71
	R	152	630	13.87	96.95	5.99
	U	80	537	12.48	82.14	4.32
Maharashtra	T	79	513	11.98	85.98	4.11
	R	90	529	12.29	93.55	4.33
	U	49	482	11.41	73.92	3.54
Orissa	T	135	507	11.86	88.47	4.80
	R	140	505	11.84	89.88	4.84
	U	68	526	12.03	78.70	4.14
Punjab	T	81	512	11.84	67.75	4.27
	R	88	515	11.76	67.92	4.41
	U	51	503	12.04	67.38	3.73
Rajasthan	T	108	656	14.13	95.45	5.65
	R	118	675	14.41	97.78	5.93
	U	53	587	13.07	87.92	4.37

Table 2. (Concld.)

India/ States	Total Rural Urban	IMR (per 1000 live births)	Ratio of Children aged 0—4 to women aged 15—49 (per 1000) CW_2	Percentage of children aged 0—4 to total population CP_2	Percentage of women aged 20—24 ever married PEM_2	Estimated TFR
Tamil Nadu	T	91	435	11.17	77.30	3.60
	R	104	450	11.48	80.97	3.87
	U	55	404	10.53	71.00	2.92
Uttar Pradesh	T	150	629	13.51	94.40	6.03
	R	157	640	13.68	97.68	6.20
	U	97	581	12.75	80.94	5.00
West Bengal	T	N.A.	493	11.50	80.57	4.20
	R	N.A.	546	12.50	87.65	4.73
	U	N.A.	355	8.74	62.37	2.82

Note : *Excludes Assam except estimate of IMR includes Assam.

N.A. = Not Available



Based upon Survey of India map with the permission of the Surveyor General of India

The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

The boundary of Meghalaya shown on this map is as interpreted from the North-Eastern Areas (Reorganisation) Act 1971 but has yet to be verified

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Table 3. Estimates of GRR and TFR for India and Major States using the Gunasekaran-Palmore Model and Comparison with the TFR estimated by Palmore's 1978 Regression Equations

India/ States	Estimated GRR by Gunasekaran-Palmore Model	Estimated TFR as TFR = 2.05 GRR using the Estimated GRR	Estimated TFR by Palmore's 1978 Regression Equations	Difference
India	2.31	4.74	4.79	(—) 0.05
States				
Andhra Pradesh	2.21	4.53	4.14	(+) 0.39
Bihar	2.72	5.58	5.82	(—) 0.24
Gujarat	2.10	4.31	4.60	(—) 0.29
Haryana	2.56	5.25	5.33	(—) 0.08
Karnataka	2.19	4.49	4.19	(+) 0.30
Kerala	1.53	3.14	2.77	(+) 0.37
Madhya Pradesh	2.68	5.49	5.71	(—) 0.22
Maharashtra	2.07	4.24	4.11	(+) 0.13
Orissa	2.36	4.84	4.80	(+) 0.04
Punjab	1.91	3.92	4.27	(—) 0.35
Rajasthan	2.80	5.74	5.65	(+) 0.09
Tamil Nadu	1.81	3.71	3.60	(+) 0.11
Uttar Pradesh	2.87	5.88	6.03	(—) 0.15
West Bengal	2.07	4.24	4.20	(+) 0.04

Table 4. Estimate of Fertility for India (Total)* by Brass's P/F Ratio Method using the 1981 Census Five Percent Sample

Age of Women	Age Specific Fertility Rate (f_i)	Cumulative Current Fertility (ϕ_1)	Multiplying Factor k_1 (m=29.43)	$\phi_1+k_1f_1=F_1$	Mean Parity (P_1)	P_1/F_1	Adjusted f_1
15—19	0.056		1.705	0.095	0.173	1.821	0.076
20—24	0.188	0.280	2.796	0.806	1.133	1.406	0.255
25—29	0.186	1.220	2.992	1.777	2.413	1.358	0.253
30—34	0.137	2.150	3.102	2.575	3.455	1.342	0.186
35—39	0.088	2.835	3.223	3.119	4.264	1.367	0.120
40—44	0.046	3.275	3.455	3.434	4.712	1.372	0.062
45—49	0.033	3.505	4.216	3.644	4.989	1.369	0.045
Total 15—49 yrs.	0.734	3.670					4.99

Source : Census of India, 1981 (1984a)

*Excluding Assam

Table 5. Estimate of Fertility for India (Rural)* by Brass's P/F Ratio Method using the 1981 Census Five Percent Sample

Age of Women	Age Specific Fertility Rate (f_i)	Cumulative Current Fertility (ϕ_i)	Multiplying Factor k_i (m=29.75)	$\phi_i+k_if_i=F_i$	Mean Parity P_i	P_i/F_i	Adjusted f_i
15—19	0.061		1.659	0.101	0.187	1,851	0.080
20—24	0.198	0.305	2.788	0.857	1.185	1.383	0.261
25—29	0.195	1.295	2.988	1.878	2.473	1.317	0.257
30—34	0.148	2.270	3.098	2.729	3.528	1.293	0.195
35—39	0.097	3.010	3.219	3.322	4.351	1.310	0.128
40—44	0.052	3.495	3.445	3.674	4.805	1.308	0.068
45—49	0.037	3.755	4.181	3.910	5.073	1.297	0.049
Total 15—49 yrs.	0.788	3.940					5.19

Source ; Census of India, 1981 (1984a)

*Excluding Assam

Table 6. Estimate of Fertility for India (Urban)* by Brass's P/F Ratio Method using the 1981 Census Five Percent Sample

Age of Women	Age Specific Fertility Rate (f_i)	Cumulative Current Fertility (ϕ_i)	Multiplying Factor k_i (m=28.62)	$\phi_i + k_i f_i = F_i$	Mean Parity P_i	P_i/F_i	Adjusted f_i
15—19	0.041		1.978	0.081	0.132	1.630	0.062
20 24	0.159	0.205	2.844	0.657	0.989	1.505	0.240
25—29	0.161	1.000	3.012	1.485	2.241	1.509	0.243
30—34	0.102	1.805	3.122	2.123	3.220	2.517	0.154
35—39	0.057	2.315	3.248	2.500	3.979	1.592	0.086
40—44	0.025	2.600	3.518	2.688	4.376	1.628	0.038
45—49	0.019	2.725	4.414	2.809	4.682	1.667	0.029
Total 15—49 yrs.	0.564	2.820					4.26

Source : Census of India, 1981 (1984a)

*Excluding Assam

adjustment is, therefore, made in the fourth and fifth columns, with the help of multiplying factors (k_i) to obtain the values of cumulated current fertility (F_i) directly comparable to the average numbers of children ever born (P_i).

The comparision of P_i and F_i values is shown by the ratio P_i/F_i in the seventh column. The values for the age group 15-19 may be ignored, being highly uncertain due to random fluctuations and age misstatement effects. In the eighth column, the current age-specific fertility rates, as inflated by P_3/F_3 factor (1.358 for total, 1.317 for rural, and 1.509 for urban), are given. The adjusted TFRs are shown in the eighth column.

Among the most important results of the P/F method are the P/F ratios themselves, shown in the seventh column. These are significantly higher than unity. For earlier age groups, this implies mainly under-reporting of current fertility (based on births in the 12 months prior to March 1981) as revealed in the F values. For later age groups, the P/F ratios are likely to decline with increasing age due to recall lapses when current fertility is constant, but increase with increasing age when there are sharp fertility reductions among older women in their late thirties or forties. It is these women who are most likely to first turn to methods of fertility control, especially terminal procedures such as sterilization, which is the principal family planning method used in India. While an increasing trend in P/F ratios with increase in age of women is discernible in the urban areas, the ratios seem to be somewhat constant at higher ages in the total and rural areas indicating that while fertility decline has occurred among older women, the reduction is not sharp enough to affect the P/F ratios.

If the age-specific fertility pattern is fairly correct, but fertility has been declining in the recent past, the estimated F values are likely to be smaller than in a situation when there has been no decline in fertility at all. Especially when fertility is declining among younger women in the recent past, there would be an inflation of the P/F adjustment factor, normally based on the age group 20—24 or 25—29, and consequently the estimated age-specific rates could well be an upper bound (Holla 1985).

IV. COMPARISON OF DIFFERENT FERTILITY ESTIMATES

A comparative picture of the TFR estimates for India and her states is given in Table 7. The TFR for India in 1981 (5.0) arrived at by the P/F method is the highest. For individual states also, the P/F estimates are generally higher than the corresponding estimates by the other four methods. We believe that the P/F estimates can be viewed as an upper bound in the case of the country as a whole and in states which have experienced a substantial recent fall in fertility among young women.

The TFR values given in the sixth column of Table 7 are based on Rele's method (Rele 1967) using an extended methodology he developed, to appear in a forthcoming paper (Rele 1987). The estimated TFR values are reproduced from his paper.

The estimates in Table 7 of TFR using the 1978 Palmore regression equations (column 2), the Gunasekaran-Palmore 1984 Model (column 3), adjusted SRS (column 4), and Rele's method (column 6) generally agree if we ignore differences of 0.2 and less. For Madhya Pradesh, Maharashtra, and Orissa, the TFR estimates by SRS are lower than the Palmore estimates. For Orissa, no correction factor was available to adjust the SRS estimates as has been done for the other states except Bihar and West Bengal. The TFR for Orissa (4.3) shown in column 4 under SRS in Table 7 is, therefore, an underestimate. The adjusted estimate of 3.7 for Maharashtra also seems to be on the lower side as both the Palmore and Rele methods indicate a TFR of 4.1 for this state.

The TFR estimated for Madhya Pradesh (5.7) by the Palmore method, though nearly corroborated by the application of the Gunasekaran-Palmore model, is definitely on the high side. The reason is not hard to find. Palmore's method is sensitive to the IMR. Estimates of the IMR for Madhya Pradesh by the SRS have been consistently high, with almost no change since 1978.

Table 7. Estimates of TFR for India and Major States in 1981 by Different Methods — A Comparison

India/ States	Estimated TFR by				
	Palmore 1978 Regression Equations	Gunasekaran-Palmore Model	Adjusted SRS	Brass's P/F Ratio Method	Rele Method
India	4.79	4.74	4.64	4.99	4.65
States					
Andhra Pradesh	4.14	4.53	4.24	4.47	4.45
Bihar	5.82	5.58	5.70	5.44	5.62
Gujarat	4.60	4.31	4.35	4.79	4.39
Haryana	5.33	5.25	5.06	5.45	5.17
Karnataka	4.19	4.49	4.00	4.63	4.49
Kerala	2.77	3.14	2.85	3.39	3.14
Madhya Pradesh	5.71	5.49	5.21	5.50	5.10
Maharashtra	4.11	4.24	3.69	4.19	4.14
Orissa	4.80	4.84	4.30	4.93	4.55
Punjab	4.27	3.92	4.08	5.19	4.28
Rajasthan	5.65	5.74	5.45	6.21	5.62
Tamil Nadu	3.60	3.71	3.47	3.88	3.55
Uttar Pradesh	6.03	5.88	5.94	6.22	5.70
West Bengal	4.20	4.24	4.20	4.62	4.18

Notes : (1) The figures in Column 4 are TFRs provided by SRS (Registrar General, India, 1985) as adjusted by the correction factors given in Appendix Table A1. For Bihar, Orissa and West Bengal, the adjustment could not be made in the absence of correction factors.

(2) The figures given in Column 6 are based on Rele method using the extended methodology and are reproduced from a forthcoming paper (Rele, 1987). The estimates relate to the period 1976—81.

The IMR was 143 in 1978, 143 in 1979, 142 in 1980, and 142 in 1981. During the same period, the IMR for India as a whole declined from 127 to 110.

The Rele estimates of the TFR relate to the quinquennium 1976-81 and those by the Palmore method and the SRS relate to 1981. One would therefore expect the Rele estimates to be somewhat higher than the other two estimates, because of declining fertility.

For Uttar Pradesh, the TFR estimated using Rele's method (5.7) seems to be low, since the Palmore, Gunasekaran-Palmore and adjusted SRS estimates all give a rate around 6.0 in 1981. A comparison of the TFR for Madhya Pradesh as estimated by the Palmore method(5.7) and the Brass method (5.5) confirms that the Palmore method gives an unreasonably high figure for this state. For Maharashtra, Punjab, Rajasthan, Tamil Nadu, and West Bengal, however, the Palmore method estimates of the TFR for 1981 compare well with the Rele method estimates. Notwithstanding the slight difference in the period for the estimates, the estimates by the Palmore method and Rele's method almost tally.

To sum up, the following are the different TFR estimates for India for the periods indicated.

Source of Estimates	Period/Year	Estimated TFR
Palmore 1978 regression equations	1981	4.8
SRS (adjusted)	1981	4.6
Gunasekaran-Palmore Model	1981	4.7
Rele Method (Rele 1987)	1976-81	4.7
Dyson and Somawat (1983) based on 1979 Fertility Survey	1978	5.0
Jain and Adlakha (1982)	1978	4.9
Relational Gompertz Model (Zaba's ratio technique 1981, Somawat 1984)	1979	4.8

In view of the foregoing comparisons, we believe that the estimates of TFR for India and her major states produced by the Palmore 1978 regression equations, to which this report addresses itself mainly, are generally acceptable. Even in the case of Madhya Pradesh where the estimate is high, this method can be applied to assess trends, if not the actual level.

V. NEW FERTILITY ESTIMATES FOR INDIA AND MAJOR STATES : 1971

Having determined that the Palmore 1978 equations provide reasonably good estimates for 1981, we subsequently relied only on that one method to produce new estimates for 1971 to allow an assessment of trends using a consistent methodology. For 1971, we did, however, avail ourselves of the estimates of others for India as a whole to satisfy ourselves that at least this one number was not outlandish. The estimates compare well :

Source of Estimates	TFR
Palmore 1978 regression equations	5.8
Dyson 1979	5.7 — 5.9
Jain and Adlakha 1982	5.75
Mari Bhat, Preston, and Dyson 1984	5.6
Rele 1978 (average of 1966-71 and 1971-76 rates)	5.6

The new estimates of the 1971 total fertility rates for all India and her major states (total, urban and rural) are given in Table 8.

Table 8. Estimates of Total Fertility Rates for India and Major States for 1971 using Palmore's 1978 Regression Equations

India/ States	Total Rural Urban	IMR (per 1000 live births)	Ratio of Children aged 0—4 to women aged 15—49 (per 1000) CW_2	Percentage of children aged 0—4 to total population CP_2	Percentage of women aged 20—24 ever married PEM_2	Estimated TFR
1	2	3	4	5	6	7
India*	T	129	650	14.44	90.53	5.84
	R	138	670	14.83	93.30	6.10
	U	82	573	12.93	80.87	4.68
States						
Andhra Pradesh	T	106	599	13.83	95.49	5.04
	R	115	610	13.97	97.27	5.25
	U	65	554	13.27	89.21	4.12
Bihar	T	N.A.	643	14.59	96.41	6.55
	R	N.A.	645	14.73	96.92	6.61
	U	N.A.	627	13.32	91.67	6.00
Gujarat	T	144	651	14.46	89.84	6.06
	R	155	683	14.96	93.54	6.45
	U	110	573	13.17	81.54	5.01
Haryana	T	72	781	15.72	94.33	6.27
	R	74	817	16.22	97.40	6.59
	U	58	622	13.40	81.48	4.81

Karnataka	T	95	652	14.41	88.65	5.42
	R	105	676	13.32	92.31	5.74
	U	54	579	13.32	79.12	4.31
Kerala	T	58	550	13.38	67.26	4.11
	R	60	559	13.52	68.26	4.20
	U	48	509	12.65	62.36	3.68
Madhya Pradesh	T	135	747	16.04	96.62	6.68
	R	144	759	16.30	98.10	6.88
	U	79	686	14.75	89.85	5.51
Maharashtra	T	105	643	14.39	90.05	5.45
	R	111	678	15.13	95.89	5.75
	U	88	566	12.76	79.04	4.72
Orissa	T	127	636	14.25	93.85	5.67
	R	131	635	14.26	94.17	5.71
	U	84	646	14.07	90.86	5.25
Punjab	T	102	611	12.99	77.92	5.38
	R	109	633	13.15	80.23	5.68
	U	76	547	12.49	71.58	4.45
Rajasthan	T	121	728	15.51	97.41	6.37
	R	127	740	15.73	98.60	6.53
	U	82	674	14.46	92.31	5.46
Tamil Nadu	T	113	531	13.09	83.03	4.59
	R	127	540	13.27	85.80	4.83
	U	77	511	12.68	77.64	3.99

1	2	3	4	5	6	7
Uttar Pradesh	T	167	685	14·67	96.14	6.67
	R	173	690	14.84	99.97	6.75
	U	119	654	13.66	86.11	5.92
West Bengal	T	N.A.	700	14.59	87.28	6.45
	R	N.A.	776	16.05	92.39	7.30
	U	N.A.	475	10.15	73.19	3.99

Note : *Excludes Assam (but includes Mizo district in 1971 which is present Mizoram Union Territory) to make TFRs for India in 1971 and 1981 comparable since 1981 census was not conducted in Assam. Estimate of IMR for India includes Assam state.

N.A. = Not available.

VI. TRENDS IN INDIA'S FERTILITY

During the decade 1971-81, the TFR for India as a whole declined from 5.8 to 4.8—a decline of 17.2 percent. In the rural areas, the decline was from 6.1 to 5.1 (16.4 percent) and in the urban areas from 4.7 to 3.7 (21.3 percent). The decline was, therefore, faster in urban areas than in rural areas.

The crude birth rates (CBR) in 1981 for India and the fourteen major states derived by Palmore equations are given in Table 9. The CBR for 1971 by the same method was 40.1 for all India (Palmore 1978, p. 28). During the decade 1971-81, hence, the all India CBR declined from 40.1 to 34.7—a decline of 13.5 percent.

During the 1971-81 decade, five states registered important fertility declines as measured by their estimated total fertility rates: the states of Gujarat (1.5), Karnataka (1.2), Kerala (1.3), Maharashtra (1.4), Punjab (1.1), and West Bengal (2.3). West Bengal showed a spectacular decline, 35 per cent during one decade. By 1981, the fertility level in urban West Bengal was the lowest among all states except Kerala. The states of Haryana, Madhya Pradesh, and Tamil Nadu registered declines of one point, like the country as a whole, while Andhra Pradesh and Orissa declined by 0.9 point. The states of Bihar, Rajasthan, and Uttar Pradesh showed smaller declines (0.7 to 0.8) and in these states the fertility levels were still high.

In 1981, the fertility level was highest in Uttar Pradesh (6.0), which also leads all states in sheer population size (110.9 million in 1981). Kerala had the lowest fertility level (2.8).

In relation to the national average, the fertility level in 1981 was high in the northern states of Bihar, Haryana, Madhya Pradesh, Rajasthan, and Uttar Pradesh. The fertility level was comparatively low in the southern states of Kerala, Tamil Nadu, Karnataka, and Andhra Pradesh, and in Maharashtra and Punjab. Fertility was at a medium level in the eastern states of Orissa and West Bengal and the western state of Gujarat.

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Table 9. Estimates of Crude Birth Rates for Indla and Major States for 1981 using Palmore's 1978 Regression Equations

India/ States	Total Rural Urban	IMR (per 1000 live births)	Index of fertility age composition (IFAC)	Ratio of children aged 0—4 to total population (CW_2)	Percentage of Children aged 0—4 to total population (CP_2)	Estimated CBR
1	2	3	4	5	6	7
India*	T	110	1.104	546	12.59	34.74
	R	119	1.090	567	12.91	36.05
	U	62	1.146	484	11.55	28.92
States						
Andhra Pradesh	T	86	1.096	514	12.16	31.52
	R	93	1.080	526	12.29	32.22
	U	52	1.143	476	11.75	28.26
Bihar	T	N.A.	1.116	597	13.37	39.16
	R	N.A.	1.114	602	13.56	40.22
	U	N.A.	1.128	560	12.25	32.42
Gujarat	T	116	1.131	518	12.42	35.04
	R	123	1.113	540	12.72	36.10
	U	89	1.167	472	11.75	31.68
Haryana	T	101	1.122	620	13.34	36.35
	R	108	1.107	643	13.56	37.35
	U	52	1.169	543	12.55	30-75

Karnataka	T	69	1.117	538	12.50	31.25
	R	77	1.099	557	12.73	32.25
	U	45	1.157	496	11.93	28.41
Kerala	T	37	1.127	409	10.77	24.37
	R	40	1.240	419	10.97	26.77
	U	24	1.139	367	9.91	21.57
Madhya Pradesh	T	142	1.097	611	13.59	39.71
	R	152	1.086	630	13.87	41.07
	U	80	1.138	537	12.48	32.45
Maharashtra	T	79	1.101	513	11.98	30.71
	R	90	1.069	529	12.29	31.84
	U	49	1.160	482	11.41	27.79
Orissa	T	135	1.068	507	11.86	34.65
	R	140	1.060	505	11.84	34.89
	U	68	1.135	526	12.03	30.54
Punjab	T	81	1.112	512	11.84	30.81
	R	88	1.088	515	11.76	30.94
	U	51	1.171	503	12.04	29 39
Rajasthan	T	108	1.110	656	14.13	38.47
	R	118	1.101	675	14.41	39.85
	U	53	1.145	587	13.07	31.84
Tamil Nadu	T	91	1.077	435	11.17	29.11
	R	104	1.053	450	11.48	30.52
	U	55	1.125	404	10.53	25.41

1	2	3	4	5	6	7
Uttar Pradesh	T	150	1.085	629	13.51	40.29
	R	157	1.077	640	13.68	41.17
	U	97	1.122	581	12.75	34.60
West Bengal	T	N.A.	1.132	493	11.50	30.45
	R	N.A.	1.126	546	12.50	33.59
	U	N.A.	1.147	355	8.74	28.18

Note : *Excludes Assam state, except estimate of IMR for India includes Assam.

N.A. = Not Available.

VII. SUMMARY

Using age and marital status data from the five percent sample of the 1981 Census of India and the ten percent rural and tewenty percent urban samples of the 1971 Census and the infant mortality rates and expectation of life at birth estimates available from the Sample Registration System, this paper has applied Palmore's regression equations (Palmore 1978) to estimate fertility levels in 1981 and 1971 for India and her 14 major states. Comparison with other systems of estimation suggests that Palmore's methodology gives near true levels of fertility at both national and subnational levels.

The results support the contention that India has, in general, reduced its fertility during the last decade. The state of West Bengal showed a spectacular decline in fertility, 35 percent during the decade. Fertility is lowest in the southernmost states of Kerala and Tamil Nadu. High fertility remains in Bihar, Haryana, Madhya Pradesh, Rajasthan, and Uttar Pradesh, which may call for more concerted efforts at fertility reduction in those states.

FOOTNOTES

[1]Appendix A provides a more detailed review of the sources of fertility data.

[2]We also considered such methods as those of Coale, Hill, and Trussell (1975), Arriaga and Anderson (1975), and Gunasekaran and Palmore (1985). We finally had to eliminate a few choices because of time constraints and data requirements.

[3]Future cooperative work between the Office of the Registrar General, India, and the East-West Population Institute, East-West Center, includes the preparation of own-children estimates based on special tabulations now being undertaken.

[4]This paragraph paraphrases material in Gunasekaran and Palmore 1984 and Gunasekaran and Palmore 1985. Also see Hannenberg 1983.

[5]The RLEAP algorithm is available in the subroutines of the International Mathematical and Scientific Libraries (IMSL) computer programs, Library 1, Edition 6, 1977 (Vol. 2), Subroutine RLEAP. A technical discussion of the algorithm is available in Furnival and Wilson 1974.

[6]Material in items (1) through (7) above and the preceding paragraph are summarized from, and often direct quotations from, Palmore 1978, pp. 43—46.

[7]Since the five percent sample data are used, it is is likely that new estimates may be required when the full 20 percent sample data are available.

APPENDIX A

APPENDIX A

SOURCES OF DATA ON FERTILITY

Fertility measures can be broadly classified into two categories—direct measures based on both census and vital statistics data and indirect measures derived from census data alone (Bogue and Palmore 1964, p. 316). Examples of direct measures are the crude birth rate (CBR), the general fertility rate (GFR), age-specific fertility rates (ASFR), and the total fertility rate (TFR). Indirect measures of fertility include ratios such as the child-woman ratio and the percentages of children aged 0—4, 5—9, and 0—14 in the total population—all of which can be readily computed from census data. Direct measures of fertility can also be computed from census data if, for instance, questions like the number of children ever born, own children under 5 or 10, and children born during a fixed reference period are included in the census questionnaire.

The sources for such data in India are many. They include the decennial censuses, the Civil Registration System, the Sample Registration System, the National Sample Survey, and fertility surveys conducted from time to time

Decennial Censuses

India has had an unbroken series of decennial censuses since the first synchronous census conducted in 1881. The earliest attempt to collect direct information on fertility and mortality in a population census was made in 1911. At that time, information on the fertility of couples was collected on a voluntary basis in two provinces. The coverage was extended to more areas in 1921, and in 1931 the entire country was covered in this inquiry. The enumerators were, however, given the discretion to choose who should be asked these questions. Further, most of the filled-in slips had to be rejected since they

were either incomplete or unintelligible. On the whole, hence, estimation of fertility levels was not feasible from these inquiries.

The questions on fertility and mortality were made compulsory in the 1941 census, but the data were not tabulated because of curbs arising out of the Second World War. In 1951, questions on fertility and mortality were also asked, but only in the states of Madhya Pradesh, Travancore-Cochin and Bihar. In a 1961 census fertility inquiry, data on fertility and mortality were collected but the tabulations were once again restricted because of financial and time constraints. In 1971, an attempt was made to collect data on current fertility on a uniform basis throughout the country. The specific questions addressed to currently married women related to (a) age at marriage and (b) whether a child was born in the previous year. Unfortunately, while the results from this inquiry were published, there were serious problems with the data. One problem had to do with variations in the raference period for the question on births in the last year : the time period actually asked about varied from state of state and ranged from about ten months to more than one year.

In the 1981 census, four questions relating to fertility were canvassed. These pertained to age at marriage, number of surviving children, number of children ever born, and whether any child was born during the last one year. The first three questions were canvassed for all ever married women while the last one was asked only of currently married women. The questions on fertility were asked in this census for a sample of 20 percent of the enumeration blocks in major states, (i.e., states with more than 10 million population). An enumeration block contained a population roughly 750 to 1000 persons in rural areas and 600 to 750 persons in urban areas. In the smaller states of Himachal Pradesh, Jammu and Kashmir, Manipur, Meghalaya, Nagaland, Sikkim, and Tripura, and the nine Union Territories, the fertility questions were canvassed on 100 percent basis. The 1981 census could not be conducted in Assam State owing to the disturbed conditions that prevailed in that state then.

A five percent sample was drawn for India (including all states and Union Territories) for advance tabulation. Reports and tables for India and the major states based on this five percent sample have already been published (Census of India, 1981, 1984a to 1984l). The full count fertility tables for the smaller states and the union territories have all been published as well. The final 20 percent fertility tables pertaining to India and the major states are, however, still being processed and it may be some time before these are published. In the present study, hence, the five percent sample data on fertility relating to India and her major states (which account for about 93 percent of the country's population) are analysed.

Civil Registration

India has a long tradition of civil registration—the registration of births and deaths. To date, however, this system has not been uniformly administered throughout the country and has been functioning at different levels of efficiency in the different states. In the words of the Registrar General, India :

> The importance of reliable data on vital events is realized but the problems of collection of the data in a vast country as India where 80 percent of the people live in over half a million villages spread far and wide, are such that completeness of registration of vital events cannot be easily achieved. (Census of India, 1971.1972, p. ix,)

The need for better vital statistics has engaged the attention of the Government on several occasions and many committees and conferences have discussed the limitations of the system and made recommendations for improvement.

The Registration of Births and Deaths Act (1969) makes the registration of births and deaths compulsory all over the country. Nevertheless, the system continues to suffer from under-registration, incomplete coverage, and content errors. For the country as a whole, the extent of under-registration is probably

40 or 50 percent with wide variations among the states (Registrar General, India, 1978). Proper assessment of fertility levels from the Civil Registration data is, hence, very difficult.

Sample Registration System (SRS)

In the absence of dependable vital rates from the civil registration system, the Office of the Registrar General, India, initiated the registration of births and deaths for a sample of the country. This system, known as the Sample Registration system, began on a pilot basis in a few selected states in 1964-65. The SRS now covers almost the entire country, with its main objective being to provide reliable estimates of birth and death rates at the state and national levels for rural and urban areas separately.

The SRS is based on a dual record system in a random sample of villages and urban blocks. Field investigation essentially consists of (a) the continuous enumeration of births and deaths by a local part-time enumerator and (b) an independent retrospective survey every six months carried out by a full-time supervisor. The data obtained from the two sources are matched and all partially matched and unmatched events are verified in the field to obtain an unduplicated count of events. The system, thus, combines the advantages of both continuous enumeration and survey procedures.

The sample unit in rural areas is a village, or a segment of a village if the village has a population of 2,000 or more. In urban areas, the ultimate sampling unit is a census block with a population ranging from 750 to 1000. The old sample units (3,700 in all) were selected using the 1961 census as the sampling frame. During the Fifth Five Year Plan, an additional 1,700 sample units, selected using the 1971 census as the frame, were added. The original 3,700 units have now been replaced, in two phases, by units from the 1981 Census Houselist (conducted in 1980), the last phase being effective from January 1983. The additional sample of 1,700 units has also been replaced based on the 1981

Census Houselist frame, with effect from January 1984. The current sample size of SRS is 6,022 units covering a population of roughly six million people. Vital rates based on these data are published regularly.

Recently, the Office of the Registrar General, India, carried out a systematic and coordinated effort to assess the accuracy of the SRS in diflerent states through an intensive field inquiry conducted by senior level personnel in the second half of 1981. This research included a ten percent subsample of SRS units in the major states (Census of India, 1981, 1984m, pp. 1 – 5). The objective was to provide information on the under-enumeration of population and vital events in the SRS so that correction factors could be calculated for adjusting the vital rates estimated from the SRS. In addition, the intensive inquiry was to provide information on what types of events were missed, allowi g the Registrar General to initiate measures for further improvement. The correction factors proposed for adjusting the SRS birth rates are reproduced in Appendix Table Al.

National Sample Survey (NSS)

Before the SRS came into being, estimates of birth and death rates from the National Sample Survey played an important role in the formulation of five-year plans and other national policies. In 1951, the NSS began collecting information on both current and historical fertility on a nation-wide scale. From 1958 to 1968, population topics were an integral part of the NSS annual rounds. A comprehensive survey on population, fertility, family planning, and mortality was included in the 28th round of NSS (1973-74) to be repeated every five years. Comparative studies of the NSS and the SRS, however, indicated that the NSS data suffered extensive omission of events because of recall lapses and the heavy work load of the NSS investigators (Registrar General, India, 1972). Most current vital events work, hence, relies on other data sources.

Fertility Surveys

In 1972, a fertility survey was conducted in 25 percent of the households in the SRS sample villages and urban blocks and

covered 230,000 ever-married women (Registrar General, India, 1976). The data were very useful in assessing the levels and differentials in fertility and child mortality. In early 1979, a survey on infant and child mortality was conducted in some 3,700 units of the SRS along with the regular SRS half-yearly survey. A total of 4.19 million people were included in the sample. Reports on those results have been published (Registrar General, India, 1980 and 1982).

Appendix Table A1. Correction factors for the birth rates provided by SRS : India and major states, 1981.

India/State	Correction Factor
India	1.0316
States	
Andhra Pradesh	1.0592
Gujarat	1.0107
Haryana	1.0124
Karnataka	1.1106
Kerala	1.0196
Madhya Pradesh	1.0022
Maharashtra	1.0251
Punjab	1.0196
Rajasthan	1.0488
Tamil Nadu	1.0198
Uttar Pradesh	1.0233

Source : Census of India, 1981. 1984m, p. 4.

APPENDIX B

APPENDIX B

Base Data Collected for Each Country : Illustrative Computer Output for Mauritius 1972

Regression Estimation of Fertility Rates — Stage 1 — 06/21/76

East-West Population Institute Dr. J. Palmore — Page 1

Country Name : Mauritius — ID : IJS — Class : 1—Estimator

	Total Popn (1972)	Total Popn Urban (1972)	Total Popn Rural (1972)
Males	413,648	180,617	233,031
Females	412,551	184,286	228,265
Total	826,199	364,903	461,296

Age :	0—1	%Total	1—4	%Total	5—9	%Total	10—14	%Total
Males	9,711	2.35	41,458	10.02	59,911	14.48	56,145	13.57
Females	9,739	2,36	40,414	9.80	58,585	14.20	55,105	13.36
Total	19,450	2.35	81,872	9.91	118,496	14.34	111,250	13.47

Age :	15—19	20—24	25—29	30—34	35—39	40—44	44—49	Unknowns to be Distr
Females	50,437	39,673	26,963	21,483	20,457	17,663	18,412	532

Total : Females (Age 15—49) 195088

	Total	Single	Married	Widowed	Divorced	Unknowns		
Males (All Ages) (1972)	413,648	273,057	130,258	5,856	3,880	597	%Curr	%Ever
Males (15+)	246,423	105,885	130,258	5,856	3,880	544	Married	Married
Females (All Ages) (1972)	412,551	237,719	132,918	31,672	9,728	514	32.22	42.38

Females (15+)	248,708	74,031	132,807	31,672	9,720	478	53.40	70.23
Females (15—19)	50,437	43,766	6,262	21	355	33	12.42	13.23
Females (20—24)	39,673	18,288	19,731	158	1,429	67	49.73	53.90
Females (25—29)	26,963	4,675	20,479	345	1,419	45	75.95	82.66
Females (30—34)	21,483	1,687	17,966	560	1,243	27	83.63	92.15
Females (35—39)	20,457	1,018	17,216	951	1,241	31	84.16	95.02
Females (40 – 44)	17,663	754	14,122	1,635	1,122	30	79.95	95.73
Females (45—49)	18,412	675	13,701	2,957	1,062	17	74.41	90.33
Females (Age Unknown)	532	208	59	94	9	162	11.09	60.90
Total : Females (Age 15—49)	195,038	70,863	109,477	6,627	7,871	250	56.12	63.68

Median Age at Marriage (by Hajnals Linear Interpolation) 21.8 %Single at this Age 51.83

Live Births (All Ages) 20,413 Year : 1972

Mother's Age	0—14	15—19	20—24	25—29	30—34	35—39	40—44	45—49	50+	Unknowns to be Distr
Live Births	22	2,452	7,293	5,020	2,728	1,766	547	62	7	516

Crude Birth Rate : 24.71 Calculated

Crude Birth Rate : 24.80 Year ; 1972 Registered

Infant Mortality Rate : 63.80 Year : 1972 Registered

Comments :

UN Classification : Census : Data Base not determined Vital Stats : Cm

LN, 10—43 : 1972 Population Census of Mauritius vol. 1 Preliminary Report

Expectation of Life

Year : 1972	At Birth	At Age 5
Both Sexes	62.31	63.85
Males	60.70	61.10
Females	65.30	65.20

LN. 48—51 : UN Annual Questionnaire (See File)

Married Includes Consensually, Divorced Includes Separated

LN. 54 : World Health Statistics Report Vol. 27 No. 10 1974

LN. 55 ; World Health Statistics Report Vol. 27 No. 10 1974

LN. 58-62 : Personal Communication (See File) Range 1971-73 Combined

Values Calculated by GRLVILLE'S METHOD (File)

APPENDIX C

APPENDIX C

Population by Five Year Age Groups and Sex for India and States*

INDIA

Age Group	Total		Rural		Urban	
	Males	Females	Males	Females	Males	Females
1	2	3	4	5	6	7
All Ages	343,930,414	321,357,418	260,054,014	247,553,652	83,876,401	73,803,766
0—4	42,402,442	41,348,374	33,141,601	32,393,059	9,260,841	8,955,315
5—9	48,254,498	45,384,442	37,962,339	35,654,677	10,292,159	9,729,765
10—14	45,184,343	40,490,391	35,030,707	31,278,138	10,153,636	9,212,254
15—19	33,887,440	30,149,993	24,930,162	22,342,448	8,957,278	7,807,545
20—24	28,962,377	28,345,413	20,285,869	20,872,334	8,676,508	7,473,080
25—29	25,748,767	24,998,317	18,404,971	18,512,287	7,343,796	6,486,031
30—34	21,598,977	20,842,946	15,582,955	15,877,576	6,016,022	4,965,370
35—39	19,925,069	18,969,879	14,598,043	14,550,775	5,327,026	4,419,105
40—44	18,042,119	16,169,843	13,383,641	12,675,367	4,658,478	3,494,477
45—49	15,403,178	13,846,536	11,634,258	10,852,040	3,768,920	2,994,496

50—54	13,834,004	11,609,376	10,677,000	9,181,178	3,154,004	2,428,199
55—59	8.517,891	7,923,572	6,563,167	6,335,001	1,954,724	1,588,571
60—64	9,376,898	8,776,891	7,550,122	7,072,974	1,826,777	1,703,917
65—69	4,782,757	4,716,073	3,842,235	3,780,687	940,521	935,386
70—74	4,184,615	4,014,866	3,402,407	3,225,108	782,208	789,758
75—79	1,604,276	1,562,334	1,290,930	1,245,302	313,346	317,032
80—84	1,362,674	1,351,594	1,107,318	1,070,258	255,356	281,335
85—89	351,799	345,635	281,898	264,728	69,900	80,906
90—94	222,259	244,811	182,963	190,967	39,297	53,844
95—99	68,272	73,468	55,259	55,636	13,014	17,832
100+	61,320	71,701	51,614	54,469	9,706	17,232
A.N.S.	157,438	120,961	94,554	68,644	62,883	52,317

DEM-110

ANDHRA PRADESH

Age Group	Total		Rural		Urban	
	M	F	M	F	M	F
1	2	3	4	5	6	7
All Ages	27,108,921	26,440,750	20,697,627	20,364,470	6,411,295	6,076,281
0—4	3,269,264	3,243,606	2,529,230	2,516,088	740,034	727,518
5—9	3,842,596	3,786,078	2,990,599	2,942,890	851,997	843,187
10—14	3,366,441	3,183,134	2,582,464	2,443,723	783,977	739,412
15—19	2,488,518	2,345,677	1,817,210	1,690,182	671,308	655,495
20—24	2,131,851	2,232,811	1,509,215	1,634,604	622,636	598,207
25—29	2,044,418	2,135,947	1,484,934	1,588,688	559,484	547,259
30—34	18,705,219	1,734,427	1,339,577	1,345,802	465,643	388,625
35—39	1,644,383	1,633,754	1,238,280	1,267,694	406,103	366,059
40—44	1,586,033	1,424.076	1,220,688	1,136,145	365,346	287,931
45—49	1,285,240	1,172,726	1,013,706	932,152	271,534	240,574
50—54	1,216,624	1,126,280	972,500	902,532	244,125	223,749
55—59	653 856	611,521	527,583	494,106	126,273	117,415

60—64	814,254	812,678	669,914	657,372	144,340	155,306
65—69	333,816	346,965	277,563	282,664	56,253	64,301
70—74	363,878	366,522	306,013	300,576	57,865	65,946
75—79	107,390	108,394	90,587	88,743	16,803	19,651
80—84	106,548	121,085	89,211	98,744	17,337	22,341
85—89	19,909	22,812	16,197	17,759	3,711	5,052
90—94	13,774	18,645	11,389	14,272	2,385	4,373
95—99	3,759	3,702	2,838	2,653	922	1,049
100+	1,715	2,380	1,370	1,660	345	720
A.N.S.	9,435	7,531	6,561	5,419	2,874	2,112

BIHAR

Age Group	Total		Rural		Urban	
	Males	Females	Males	Females	Males	Females
1	2	3	4	5	6	7
All Ages	35,930,559	33,984,173	31,170,555	30,025,187	4,760,004	3,958,986
0—4	4,651,595	4,698,654	4,118,733	4,163,878	532,861	534,775
5—9	5,533,784	5,212,613	4,905,191	4,615,917	628,593	596,697
10—14	4,876,587	4,072,198	4,267,871	3,547,350	608,716	524,849
15—19	3,208,450	2,734,848	2,710,775	2,359,698	497,675	375,151
20—24	2,635,463	2,813,763	2,187,983	2,465,534	447,479	348,229
25—29	2,536,494	2,589,681	2,151,180	2,269,358	385,314	320,323
30—34	2,316,969	2,387,290	1,971,888	2,099,208	345,081	288,082
35—39	2,105,948	2,018,770	1,785,808	1,778,040	320,140	240,730
40—44	1,905,713	1,755,762	1,615,063	1,564,252	290,650	191,510
45—49	1,533,025	1,367,095	1,318,021	1,224,482	215,004	142,612
50—54	1,382,381	1,147,485	1,210,572	1,035,755	171,809	111,731
55—59	805,149	875,865	713,145	802,283	92,004	73,582

60—64	1,105,609	1,051,690	1,004,834	961,440	100,775	90,251
65—69	516,467	499,757	470,381	454,621	46,086	45,136
70—74	432,083	400,902	391,883	362,726	40,200	38,176
75—79	162,199	155,027	147,065	141,056	15,134	13,971
80—84	140,830	129,633	126,997	116,141	13,833	13,493
85—89	34,076	31,006	31,172	27,751	2,904	3,255
90—94	20,925	21,412	19,059	19,232	1,866	2,180
95—99	7,023	5,986	6,401	5,015	622	971
100+	7,503	6,756	6,919	5,800	584	956
A.N.S.	12,288	7,980	9,615	5,651	2,673	2,329

Age group	Total		Rural		Urban	
	Males	Females	Males	Females	Males	Females
1	2	3	4	5	6	7
All Ages	17,552,640	16,533,159	11,986,672	11,497,474	5,565,968	5,036,685
0—4	2,152,948	2,079,477	1,515,849	1,471,456	637,099	608,021
5—9	2,368,180	2,193,489	1,689,948	1,566,892	678,232	626,597
10—14	2,345,369	2,078,416	1,657,999	1,471,246	687,370	607,170
15—19	1,880,185	1,690,932	1,251,840	1,152,310	628,345	538,621
20—24	1,685,052	1,689,858	1,067,353	1,119,097	617,699	570,760
25—29	1,371,299	1,284,177	884,523	841,770	486,775	442,407
30—34	1,130,647	1,080,902	727,619	735,100	403,028	345,801
35—39	998,126	914,061	658,428	621,162	339,698	292,900
40—44	862,379	819,803	575,319	574,725	287,060	245,078
45—49	750,889	688,474	516,067	486,769	234,822	201,706
50—54	637,815	559,505	445,295	398,260	192,520	161,245
55—59	398,988	396,989	281,660	288,642	117,328	108,346

60—64	407,853	428,089	299,996	313,947	107,857	114,142
65—69	225,009	242,671	164,736	178,224	60,273	64,447
70—74	189,247	202,263	141,707	148,558	47,539	53,705
75—79	64,546	75,850	46,172	53,629	18,374	22,221
80—84	52,509	65,299	38,738	46,426	13,770	18,873
85—89	13,965	17,111	10,053	11,711	3,912	5,400
90—94	8,425	13,131	6,297	9,012	2,128	4,119
95—99	3,274	5,967	2,654	3,995	620	1,973
100+	2,120	4,410	1,660	2,862	460	1,548
A.N.S.	3,814	2,285	2,756	1,681	1,058	604

Age Group	Total		Rural		Urban	
	Males	Females	Males	Females	Males	Females
1	2	3	4	5	6	7
All Ages	6,909,938	6,012,680	5,380,966	4,714,265	1,528,972	1,298,415
0—4	895,905	827,649	710,602	658,042	185,303	169,608
5—9	986,374	867,190	798,499	698,647	187,875	168,542
10—14	973,407	846,537	794,627	689,481	178,780	157,056
15—19	777,622	627,144	608,494	489,054	169,128	138,090
20—24	637,523	565,139	468,290	422,530	169,233	142,609
25—29	501,153	437,922	359,657	327,882	141,495	110,040
30—34	388,670	353,988	283,205	270,060	105,465	83,928
35—39	319,903	289,459	232,746	220,166	87,157	69,294
40—44	286,799	260,270	215,157	202,635	71,642	57,635
45—49	251,884	246,820	193,178	195,241	58,706	51,579
50—54	260,184	199,533	206,438	156,647	53,746	42,886
55—59	146,440	138,052	114,812	108,548	31,629	29,504

60—64	196,533	144,713	161,778	114,887	34,755	29,826
65—69	99,875	82,357	81,976	64,768	17,898	17,590
70—74	99,815	66,151	81,241	51,265	18,574	14,887
75—79	33,558	21,952	27,558	16,897	6,000	5,055
80—84	33,727	23,497	27,758	18,184	5,969	5,313
85—89	8,604	5,388	6,841	3,942	1,763	1,446
90—94	4,907	3 958	3,871	3,078	1,035	880
95—99	1,539	1,004	1,336	571	203	432
100+	1,182	1,199	997	790	184	410
A.N.S.	4,334	2,757	1,904	950	2,430	1,807

Age Group	Total		Rural		Urban	
	Males	Females	Males	Females	Males	Females
1	2	3	4	5	6	7
All Ages	18,922,627	18,213,087	13,352,400	13,053,708	5,570,227	5,159,379
0—4	2,351,752	2,288,876	1,697,594	1,662,787	654,158	626,089
5—9	2,595,796	2,589,094	1,887,770	1,891,882	708,026	697,213
10—14	2,448,412	2,401,349	1,769,704	1,748,787	678,707	652,562
15—19	1,912,420	1,772,202	1,296,113	1,213,933	616,307	558,269
20—24	1,669,060	1,587,342	1,085,516	1,070,485	583,544	516,857
25—29	1,427,773	1,466,056	948,100	1,007,495	479,674	458,561
30—34	1,157,893	1,149,358	775,292	818,671	382,601	330,687
35—39	1,094,764	1,054,270	762,170	757,148	332,594	297,123
40—44	987,475	869,835	704,665	643,960	282,810	225,875
45—49	852,246	719,690	614,608	524,372	237,638	195,318
50—54	741,305	676,192	546,224	503,427	195,081	172,765
55—59	452,075	385,241	332,303	281,901	119,772	103,341

60—64	508,039	505,652	384,442	379,804	123,597	125,849
65—69	259,973	259,915	196,710	189,651	63,263	70,264
70—74	225,609	242,170	172,042	181,319	53,567	60,851
75—79	97,229	96,498	73,537	71,654	23,691	24,844
80—84	85,027	86,671	65,482	63,687	19,545	22,985
85—89	21,044	23,277	15,576	16,746	5,467	6,531
90—94	12,403	15,453	9,769	11,261	2,633	4,192
95—99	5,256	5,563	4,168	3,771	1,088	1,792
100+	3,005	5,295	2,647	3,834	358	1,461
A.N.S.	14,071	13,086	7,966	7,134	6,106	5,952

KERALA

Age Group	Total		Rural		Urban	
	Males	Females	Males	Females	Males	Females
1	2	3	4	5	6	7
All Ages	12,527,767	12,925,913	10,167,417	10,514,988	2,360,350	2,410,925
0—4	1,391,965	1,348,532	1,149,965	1,117,768	242,001	230,765
5—9	1,485,101	1,438,754	1,222,179	1,186,191	262,923	252,563
10—14	1,644,208	1,604,045	1,350,162	1,318,323	294,046	285,722
15—19	1,443,680	1,566,497	1,167,609	1,269,026	276,071	297,471
20—24	1,250,569	1,369,822	1,001,161	1,105,974	294,408	263,848
25—29	999,713	1,081,600	793,002	867,245	206,712	214,355
30—34	788,782	788,965	621,618	630,298	167,164	158,667
35—39	674,425	726,434	542,129	592,187	132,296	134,247
40—44	561,678	571,446	451,611	462,037	110,067	109,409
45—49	576,147	593,793	466,795	482,555	109,352	111,238
50—54	445,764	438,975	357,983	352,666	87,780	86,309
55—59	369,163	372,166	296,849	297,964	72,314	74,202

60—64	330,886	352,302	273,415	287,751	57,471	64,550
65—69	240,005	278,994	200,538	224,598	39,467	54,396
70—74	146,548	174.606	119,617	140,599	26,931	34,006
75—79	92,267	112,595	78,336	92,764	13,931	19,831
80—84	52,427	62,956	44,933	51,222	7,494	11,733
85—89	24,156	28,016	20,712	22,975	3,444	5,041
90—94	6,056	9,101	5,240	7,616	816	1,485
95—99	2,018	2,805	1,762	2,294	255	511
100+	761	783	576	659	185	124
A.N.S.	1,447	2,726	1,227	2,275	221	451

MADHYA PRADESH

Age Group	Total		Rural		Urban	
	Males	Females	Males	Females	Males	Females
1	2	3	4	5	6	7
All ages	26,886,304	25,292,538	21,266,320	20,326,063	5,619,984	4,966,475
0— 4	3,573,070	3,517,293	2,904,011	2,864,936	669,059	652,357
5— 9	3,901,828	3,755,998	3,191,848	3,072,996	709,980	683,002
10—14	3,597,760	3,197,546	2,874,823	2,548,389	722,937	649,156
15—19	2,586,409	2,258,999	1,962,401	1,739,154	624,008	519,845
20—24	2,159,436	2,157,037	1,579,902	1,660,741	579,533	496,296
25—29	1,953,302	1,835,600	1,492,758	1,433,791	460,544	401,809
30—34	1,669,199	1,596,011	1,286,193	1,272,048	383,006	323,962
35—39	1,537,352	1,434,599	1,203,415	1,141,356	333,936	293,244
40—44	1,378,666	1,264,137	1,073,999	1,032,480	304,668	231,657
45—49	1,191,284	1,063,325	944,378	870,763	246,906	192,563
50—54	1,070,426	885,484	869,352	731,645	201,074	153,840
55—59	623,989	596,399	507,924	499,871	116,065	96,528

60—64	698,809	695,954	581,407	583,935	117,402	112,019
65—69	356,509	378,594	297,888	320,946	58,621	57,648
70—74	307,126	338,266	260,133	287,506	46,994	50,761
75—79	120,803	131,359	101,468	111,934	19,334	19,425
80—84	100,093	116,698	84,561	97,909	15,532	18,789
85—89	25,300	28,376	21,105	23,302	4,195	5,074
90—94	18,118	23,374	15,512	19,334	2,606	4,041
95—99	5,688	6,952	4,709	5,769	979	1,183
100+	4,469	5,638	3,774	4,271	695	1,367
A.N.S.	6,667	4,898	4,758	2,987	1,910	1,911

Age Group	Total		Rural		Urban	
	Males	Females	Males	Females	Males	Females
1	2	3	4	5	6	7
All Ages	32,415,125	30,369,044	20,527,455	20,263,120	11,887,670	10,105,924
0—4	3,853,425	3,671,227	2,573,614	2,440,638	1,279,811	1,230,589
5—9	4,288,797	4,126,581	2,909,203	2,823,176	1,379,594	1,303,405
10—14	4,224,545	3,900,451	2,850,122	2,653,923	1,374,423	1,246,528
15—19	3,149,266	2,688,532	1,948,865	1,699,547	1,200,400	988,985
20—24	2,850,440	2,662,073	1,538,563	1,636,222	1,311,877	1,025,851
25—29	2,522,439	2,434,417	1,391,374	1,491,053	1,131,064	943,364
30—34	2,114,050	2,023,647	1,195,586	1,308,618	918,464	715,029
35—39	1,973,094	1,893,277	1,176,885	1,271,729	796,209	621,548
40—44	1,740,591	1,596,287	1,074,645	1,107,410	665,946	488,877
45—49	1,524,218	1,380,245	991,989	960,098	532,229	420,147
50—54	1,265,455	1,142,794	828,630	808,828	436,826	333,966
55—59	907,756	779,929	616,741	561,707	291,015	218,223

60—64	816,303	833,797	578,628	603,779	237,675	230,018
65—69	482,227	480,405	348,382	350,673	133,845	129,733
70—74	350,663	384,630	254,108	283,641	96,555	100,988
75—79	147,098	149,620	105,894	108,478	41,205	41,142
80—84	106,145	117,416	76,068	84,400	30,076	33,016
85—89	33,325	35,584	24,193	24,974	9,132	10,610
90—94	21,813	26,562	16,983	18,805	4,830	7,757
95—99	7,214	8,158	5,478	5,647	1,735	2,511
100+	6,825	9,420	5,362	6,686	1,463	2,734
A.N.S.	29,436	23,993	16,143	13,092	13,293	10,901

Age Group	Total		Rural		Urban	
	Males	Females	Males	Females	Males	Females
1	2	3	4	5	6	7
All Ages	13,309,786	13,060,485	11,636,404	11,623,580	1,673,382	1,436,905
0—4	1,550,994	1,577,627	1,364,326	1,389,994	186,668	187,633
5—9	1,886,598	1,910,323	1,677,117	1,704,332	209,481	205,991
10—14	1,784,910	1,741,533	1,581,303	1,551,036	203,607	190,497
15—19	1,307,618	1,282,686	1,130,089	1,129,453	177,529	153,234
20—24	1,082,138	1,043,666	915,192	912,249	166,947	131,417
25—29	996,664	973,494	847,489	849,567	149,175	123,926
30—34	798,310	821,177	679,629	724,321	118,681	96,856
35—39	823,599	799,985	703,645	710,047	119,954	89,938
40—44	725,665	677,596	625,713	611,324	99,951	66,272
45—49	644,167	566,978	566,138	516,737	78,029	50,242
50—54	552,392	474,685	492,124	433,911	60,268	40,775
55—59	341,525	315,442	308,721	291,476	32,804	23,966

60—64	345,057	356,935	315,528	325,811	29,530	31,124
65—69	171,135	189,444	157,247	173,903	13,888	15,540
70—74	157,499	183,219	143,673	166,994	13,826	16,225
75—79	61,942	66,761	56,772	61,357	5,170	5,404
80—84	50,924	52,049	46,573	47,465	4,351	4,584
85—89	12,318	10,675	10,986	9,609	1,331	1,066
90—94	7,626	7,904	6,957	6,954	669	950
95—99	2,455	2,902	2,187	2,679	268	222
100+	2,020	2,449	1,858	2,165	162	284
A.N.S.	4,228	2,953	3,136	2,196	1,093	757

Age Group	Total		Rural		Urban	
	Males	Females	Males	Females	Males	Females
1	2	3	4	5	6	7
All Ages	8,937,210	7,851,705	6,444,464	5,696,694	2,492,746	2,155,011
0—4	1,036,646	951,202	746,467	681,618	290,179	269,585
5—9	1,103,103	975,614	810,834	705,098	292,269	270,516
10—14	1,121,799	980,504	840,257	728,713	281,542	251,791
15—19	1,003,527	879,445	733,673	651,021	269,854	228,424
20—24	873,845	766,102	593,351	526,379	280,494	239,723
25—29	678,131	602,134	453,406	410,752	224,725	191,381
30—34	560,602	508,798	383,161	362,802	177,442	145,995
35—39	461,759	423,028	317,854	301,676	143,905	121,353
40—44	426,873	368,481	302,247	271,162	124,626	97,319
45—49	355,933	336,687	253,450	247,522	102,483	89,165
50—54	357,164	271,887	265,553	202,405	91,611	69,483
55—59	203,912	207,942	149,212	158,730	54,700	49,211

60—64	284,007	209,051	224,049	160,689	59,958	48,363
65—69	141,709	126,105	109,766	98,647	31,943	27,458
70—74	159,984	111,230	128,755	86,618	31,229	24,612
75—79	52,416	43,267	41,584	34,725	10,832	8,542
80—84	70,266	53,060	57,174	42,576	13,092	10,484
85—89	14,879	12,268	12,081	9,283	2,799	2,985
90—94	13,851	11,426	11,499	9,232	2,353	2,194
95—99	3,569	2,598	3,005	1,999	564	599
100+	4,371	3,719	3,573	2,955	799	764
A.N.S.	8,862	7,157	3,514	2,093	5,348	5,064

Age Group	Total		Rural		Urban	
	Males	Females	Males	Females	Males	Females
1	2	3	4	5	6	7
All ages	17,864,154	16,407,708	14,013,454	13,037,900	3,840,700	3,369,808
0—4	2,441,285	2,399,167	1,965,233	1,932,615	476,052	466,551
5—9	2,677,236	2,471,458	2,164,564	1,983,940	512,673	487,518
10—14	2,437,465	2,157,579	1,948,846	1,723,484	488,620	434,095
15—19	1,775,491	1,473,689	1,332,559	1,128,404	442,931	345,285
20—24	1,447,093	1,396,298	1,048,311	1,066,060	398,782	330,238
25—29	1,306,124	1,198,215	981,909	930,679	324,216	267,536
30—34	1,096,354	1,008.597	842,890	802,350	253,464	206,248
35—39	927,017	867,222	717,608	689,058	209,409	178,164
40—44	887,693	776,680	701,990	627,929	185,703	148,751
45—49	707,075	657,156	558,633	527,894	148,442	129,262
50—54	723,542	582,097	585,574	473,625	137,968	108,472
55—59	388,402	376,641	310,028	304,847	78,374	71,794

60—64	472,162	457,417	392,126	357,683	80,036	81,734
65—69	212,831	221,428	173,338	179,180	39,493	42,248
70—74	206,444	206,802	171,022	169,838	35,422	36,964
75—79	63,298	63,245	51,745	50,094	11,553	13,151
80—84	54,535	62,659	44,375	49,948	10,159	12,711
85—89	11,355	12,021	8,777	8,855	2,578	3,166
90—94	6,643	8,078	5,490	6,083	1,153	1,995
95—99	2,253	2,893	1,727	2,030	525	863
100+	1,484	2,250	1,290	1,680	194	570
A.N.S.	8,372	6,115	5,420	3,624	2,952	2,492

TAMIL NADU

Age Group	Total		Rural		Urban	
	Males	Females	Males	Females	Males	Females
1	2	3	4	5	6	7
All Ages	24,487,623	23,920,452	16,334,231	16,121,971	8,153,393	7,798,482
0—4	2,743,513	2,663,626	1,893,151	1,834,124	850,363	829,501
5—9	2,938,662	2,839,609	1,987,043	1,911,813	951,619	927,796
10—14	2,907,170	2,802,201	1,943,075	1,878,806	964,095	923,394
15—19	2,435,571	2,466,021	1,593,132	1,603,783	842,439	862,238
20—24	2,151,196	2,166,594	1,352,790	1,370,258	798,406	796,336
25—29	1,914,524	2,022,332	1,197,931	1,307,987	716,593	714,345
30—34	1,593,336	1,568,236	998,591	1,055,996	594,746	512,240
35—39	1,587,961	1,677,692	1,053,848	1,162,531	534,113	515,161
40—44	1,423,360	1,297,827	955,170	909,306	468,190	388,521
45—49	1,340,748	1,228,512	929,745	864,218	411,004	364,295
50—54	1,047,510	958,974	728,786	676,483	318,724	282,491
55—59	794,576	703,817	548,571	495,838	246,006	207,979

60—64	678,661	644,078	480,480	448,909	198,181	195,169
65—69	398,205	373,140	290,143	262,278	108,062	110,862
70—74	277,484	265,684	197,147	179,885	80,337	85,799
75—79	130,681	115,246	94,053	77,041	36,628	38,205
80—84	82,097	82,257	59,256	52,891	22,842	29,366
85—89	25,890	25,522	19,030	16,513	6,860	9,009
90—94	11,222	13,490	8,302	9,498	2,920	3,992
95—99	2,809	3,441	2,165	2,395	643	1,046
100+	1,797	1,726	1,383	1,221	414	506
A.N.S.	649	429	441	197	209	231

UTTAR PRADESH

Age Group	Total		Rural		Urban	
	Males	Females	Males	Females	Males	Females
1	2	3	4	5	6	7
All Ages	58,819,274	52,042,736	48,041,184	42,921,762	10,778,141	9,120,974
0—4	7,672,576	7,309,737	6,381,817	6,064,348	1,290,759	1,245,390
5—9	9,106,155	7,837,635	7,613,037	6,499,504	1,493,118	1,338,131
10—14	8,005,019	6,411,804	6,594,249	5,212,092	1,410,770	1,199,712
15—19	5,526,138	4,309,030	4,373,087	3,407,533	1,153,051	901,497
20—24	4,332,592	4,262,289	3,328,695	3,425,666	1,003,897	836,623
25—29	3,912,809	3,752,073	3,093,234	3,031,467	819,574	720,606
30—34	3,416,641	3,401,978	2,722,626	2,815,615	694,015	586,363
35—39	3,185,154	3,062,632	2,563,787	2,537,327	621,367	525,305
40—44	3,096,167	2,707,422	2,512,925	2,277,780	583,241	429,643
45—49	2,464,119	2,312,197	2,020,180	1,947,149	433,939	365,048
50—54	2,565,113	1,889,518	2,138,214	1,598,591	426,899	290,927
55—59	1,390,455	1,350,889	1,153,534	1,161,047	236,921	189,842

60—64	1,757,170	1,415,544	1,508,501	1,217,685	248,668	197,859
65—69	818,552	752,504	698,192	648,669	120,360	103,836
70—74	838,324	655,021	724,593	562,546	113,730	92,474
75—79	282,181	242,285	240,352	208,096	41,829	34,189
80—84	282,605	232,239	239,306	197,584	43,299	34,755
85—89	63,381	51,479	52,887	42,465	10,494	9,014
90—94	50,872	42,618	42,627	35,192	8,245	7,426
95—99	12,781	11,324	10,303	9,543	2,478	1,782
100+	16,696	15,761	14,268	12,649	2,428	3,112
A.N.S.	23,776	16,654	14,720	9,215	9,057	7,439

Age Group	Total		Rural		Urban	
	Males	Females	Males	Females	Males	Females
1	2	3	4	5	6	7
All Ages	28,560,900	26,019,745	20,617,489	19,516,437	7,943,412	6,503,309
0—4	3,136,066	3,141,203	2,499,168	2,516,102	636,898	625,102
5—9	3,742,776	3,646,578	2,934,810	2,892,212	807,966	754,366
10—14	3,773,241	3,561,029	2,876,398	2,733,824	896,842	827,205
15—19	2,977,266	2,773,910	2,154,691	2,006,997	822,575	766,913
20—24	2,745,679	2,485,987	1,907,561	1,789,872	838,118	696,115
25—29	2,435,235	2,158,064	1,694,813	1,538,770	740,422	619,294
30—34	1,858,793	1,627,566	1,251,256	1,156,974	607,537	470,592
35—39	1,758,582	1,454,136	1,152 480	1,042,230	606,102	411,906
40—44	1,481,525	1,214,916	949,082	889,409	532,443	325,515
45—49	1,334,814	1,024,931	885,913	758,107	448,901	266,824
50—54	1,056,609	855,299	709,972	641,622	346,637	213,677
55—59	720,226	556,144	499,517	420,114	220,710	136,030

60—64	632,743	599,047	446,600	454,012	186,143	145,034
65—69	357,660	342,395	259,910	257,858	97,750	84,537
70—74	275,911	287,649	199,589	212,374	76,321	75,275
75—79	123,925	127,779	89,796	93,147	34,129	34,631
80—84	80 814	88,344	57,480	61,916	23,334	26,428
85—89	26,448	27,478	19,201	18,932	7,248	8,547
90—94	12,269	18,271	9,257	12,891	3,013	5,380
95—99	5,203	6,928	3,907	4,862	1,296	2,066
100+	3,540	5,993	2,700	4,351	840	1,644
A.N.S.	21,575	16,099	13,388	9,871	8,187	6,228

Source : Census of India, 5 per cent sample data.

Note : Due to rounding during estimation, totals may not tally exactly in some cases. A.N.S.=Age not stated.

*States with population of 10 million and more according to 1981 census.

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